NASA SBIR/STTR Technologies

T8.01-9837 - Ultra-Miniaturized Star Tracker for Small Satellite Attitude Control

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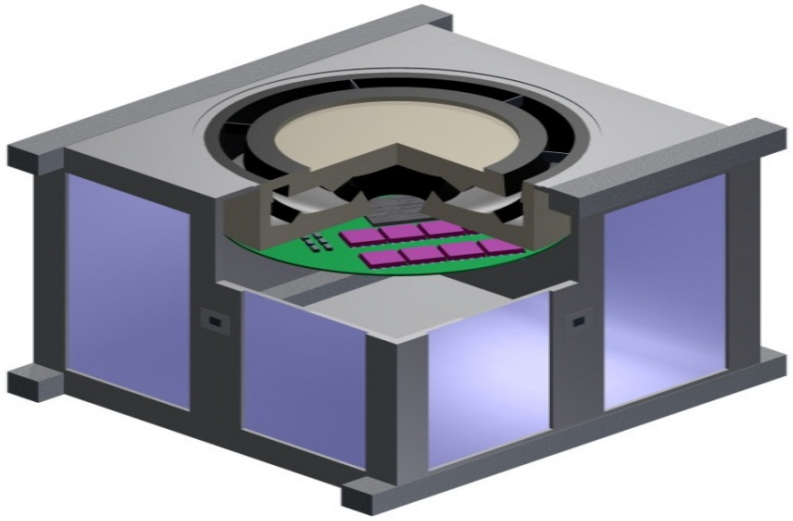
Identification and Significance of Innovation

NASA has identified the need for technology development of miniaturized instrumentation for small satellite applications. However, miniaturization must not compromise performance. One area in need of development is small satellite attitude control systems. Current technology does not provide sufficient attitude accuracy in a package small enough for small satellites. Creare proposes to develop an ultra-miniaturized star tracker based on a new folded optics design that will provide arc-second accuracy in a form factor small enough to fit in a fraction of a 1U CubeSat.
Creare has teamed with the Center for Space Science and Engineering Research at Virginia Tech (which has expertise in small satellite missions and in star tracker algorithms) and with Distant Focus Corporation, a small company that has developed the folded optics on several government-funded projects.



Estimated TRL at beginning and end of contract: (Begin: 3 End: 5)

Technical Objectives and Work Plan

Technical Objectives:
* Confirm that the star tracker has the required angular resolution.
* Confirm that the star tracker has the necessary sensitivity to image magnitude 6.3 stars with a sufficiently high sample rate.
* Determine the optimal system configuration.
* Finalize overall system design.

Work Plan:
Task 1. Design Phase I Star Tracker
Task 2. Develop Star Identification Algorithm
Task 3. Phase I Testing
Task 4. Develop Conceptual System Design
Task 5. Manage and Report

NASA Applications

Many NASA science missions are exploring the use of pico- and nano satellites as alternatives to expensive, large satellites. In order to enable many mission profiles, these satellites need precise attitude determination sensors. Our star tracker will enable highly precise attitude determination (10 arc-seconds or better) in a package that is significantly smaller, much lower mass, and uses less power than any alternative star trackers on the market.

Non-NASA Applications

Both the military and commercial ventures are looking to small satellites to provide a cost-effective space mission platform. However, the majority of missions still require high attitude accuracy. The military is also looking at star trackers for high-altitude UAV attitude determination. These will typically need to provide arc second accuracy in a small form factor with low power demands.

Firm Contacts

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